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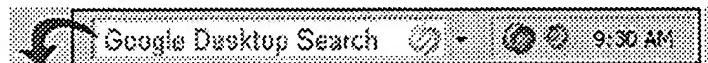
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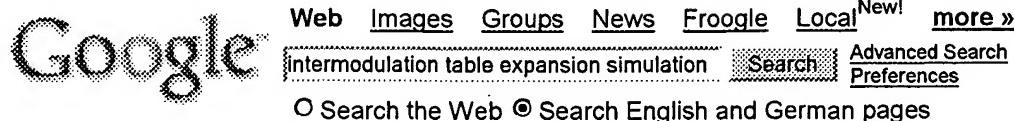
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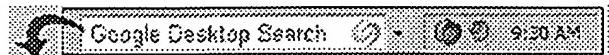
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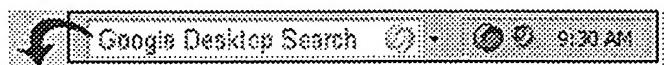
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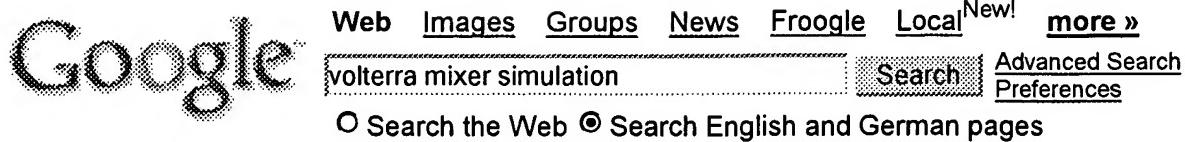
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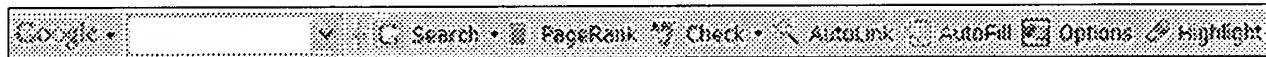
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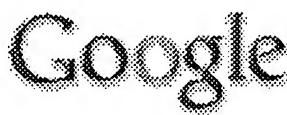
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1 dB Compression Point. **Intermodulation**. Another Fourier **Expansion**. The Fundamental

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u Output can be approximated by a Taylor series **expansion**. u Coefficient a ...

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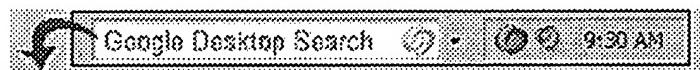
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... stage, **intermodulation** distortion, volterra series **expansion**,. Abstract:,

In this paper, volterra series **expansion** is used to compute the **intermodulation** ...

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H Darabi, AA Abidi - IEEE Journal of Solid-State Circuits, 2000 - ieeexplore.ieee.org

... the periodic steady-state (PSS) noise simulation in SPECTRE-RF. The results of the **output noise** (with respect to ... The flicker noise behavior of a **mixer** can be ...[Cited by 66 - Web Search - icst.ucla.edu - www-soem.ecu.edu.au - hwswworld.com - all 7 versions »](#)**Cyclostationary noise analysis of large RF circuits with multitone excitations**

J Roychowdhury, D Long, P Feldmann - IEEE Journal of Solid-State Circuits, 1998 - ieeexplore.ieee.org

... Through (3), the second **mixer** generates five nonzero HPSD ... The average **output noise**

(the shaded area under ... approach can be used to analyze RF noise rigorously ...

[Cited by 52 - Web Search - ieeexplore.ieee.org - laoo.dtc.umn.edu - iroi.seu.edu.cn](#)**Monolithic RF Active Mixer Design**

KL Fong, RG Meyer - IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS—II: ANALOG AND ..., 1999 - ieeexplore.ieee.org

... In contrast to the double-balanced **mixer** which has no dc ... design has a dc component in the RF signal ... If the IF **output** is taken differentially, the mixing process ...[Cited by 23 - Web Search - engr.oregonstate.edu - ieeexplore.ieee.org - csa.com](#)**A 1 GHz CMOS RF front-end IC for a direct-conversion wireless receiver**

A Rofougaran, JYC Chang, M Rofougaran, AA Abidi - IEEE Journal of Solid-State Circuits, 1996 - ieeexplore.ieee.org

... LNA) combined with a downconversion **mixer**, often labeled the front-end for an RF receiver ... conveniently low intermediate frequency (IF) at the **output** ...[Cited by 114 - Web Search - icst.ucla.edu - iroi.seu.edu.cn - csa.com - all 5 versions »](#)**A 1.5 GHz highly linear CMOS downconversion mixer**

J Crols, MSJ Steyaert - IEEE Journal of Solid-State Circuits, 1995 - ieeexplore.ieee.org

... to the virtual ground (.4, C₁, and C₂ are not taken into account) Rf. ... However, here in the **mixer** topology is the situation different. ... The **output** bandwidth BW. ...[Cited by 45 - Web Search - ieeexplore.ieee.org](#)**Reduced-order modeling of time-varying systems**

J Roychowdhury - IEEE Transactions on Circuits and Systems II: Analog and ..., 1999 - ieeexplore.ieee.org

... functions are often computed in the context of radio frequency (RF) simulation

(eg ... the th block-row of , corresponding to the th **output** harmonic or time ... **mixer** ! ...[Cited by 42 - Web Search - doi.ieeecomputersociety.org - laoo.dtc.umn.edu - sigda.org - all 14 versions »](#)**Effects of offsets on bipolar integrated circuit **mixer** even-order distortion terms**

D Coffing, E Main - IEEE Transactions on Microwave Theory and Techniques, 2001 - ieeexplore.ieee.org

... 3 is the **output** current normalized to unity ... space errors can be calculated by deriving the **mixer** gain as ... Taking the integral of the RF signal and evaluating as ...[Cited by 12 - Web Search - ieeexplore.ieee.org - csa.com - csa.com](#)**An I/Q active balanced harmonic **mixer** with IM2 cancelers and a 45 phase shifter**

T Yamaji, H Tanimoto, H Kokatsu - IEEE J. Solid-State Circuits, 1998 - ieeexplore.ieee.org

... (6) When an LO signal is input, an **output** is (7) When the LO signal and a small

RF signal are input (8) (a) (b) Fig. 18. (a) Harmonic mixer excitation. ...

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A class AB monolithic mixer for 900-MHz applications

KL Fong, CD Hull, RG Meyer - IEEE J. Solid-State Circuits, 1997 - ieeexplore.ieee.org

... 2. Class AB mixer. ... is the signal current flowing through the differential output

resistance is ... the RF input signal, and is the transconductance of the driver ...

Cited by 14 - Web Search - rfic.eecs.berkeley.edu - ieeexplore.ieee.org

Linearized mixer using predistortion technique

Y Kim, Y Kim, S Lee - IEEE Microwave and Wireless Components Letters, 2002 - ieeexplore.ieee.org

... 2. IF signal spectrum when output power is 0.18 dBm, (a ... mixer, a mini-circuit's

SCH-2500LH balanced mixer was used ... up to 2.5 GHz and is rated up an RF level of ...

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Total noise power and noise power spectral density at the **mixer output** (p. 12)

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If a conjugate match is inserted between the **mixer output** and the load, ...

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The **mixer output** wave can be modeled as2. **Equation 1** simply states that the RTZ

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the CF at the **output** of the **mixer**. Such image measurements help the. RF ...

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Fig 1b: Signals at the **output** of **mixer** ... every dB decrease of **RF** power.

From **equation** (1), it can be seen that this leads to IP3. being insensitive to **RF** ...

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... of your receiver **design**; noise figure and linearity **calculation**. ... 3) Please make a table of simulations results for each block (LNA, Mixer, ...

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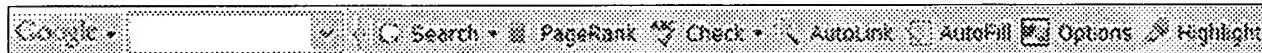
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1 [Advanced simulation techniques: A time-domain RF steady-state method for closely spaced tones](#) 

Jaijeet Roychowdhury

 June 2002 **Proceedings of the 39th conference on Design automation**

 Full text available:  [pdf\(543.95 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Verifying circuits with two or more closely-spaced driving frequencies is important in RF and wireless communications, e.g., in the design of down-conversion mixers. Existing steady-state calculation methods, like harmonic balance, rely on Fourier series expansions to find the difference-frequency components typically of interest. Time-domain methods are, however, better suited for circuits with strong nonlinearities such as switching. Towards this end, we present a purely time-domain met ...

Keywords: MPDE, RF switching mixers, analog, analog/RF simulation, artificial time scales, continuation methods, difference-frequency time scales, envelope, harmonic balance, homotopy, mixed-signal, multi-time PDEs, shooting

2 [Modeling for analog circuits: High-frequency noise in RF active CMOS mixers](#) 

Payam Heydari

 January 2004 **Proceedings of the 2004 conference on Asia South Pacific design automation: electronic design and solution fair ASP-DAC '04 , Proceedings of the 2004 conference on Asia South Pacific design automation: electronic design and solution fair ASP-DAC '04**

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A new analytical model for high-frequency noise in RF active CMOS mixers such as single-balanced and double-balanced architectures is presented. The analysis includes the contribution of non-white gate-induced noise at the output as well as the spot noise figure (NF) of the RF CMOS mixer, while accounting for the non-zero correlation between the gate-induced noise and the channel thermal noise. The noise contribution of the RF transconductor as well as the switching pair on the output noise is di ...

- 3 [Nonlinear model order reduction: Analog and RF circuit macromodels for system-level analysis](#)

Xin Li, Peng Li, Yang Xu, Lawrence T. Pileggi

June 2003 **Proceedings of the 40th conference on Design automation**

Full text available:  [pdf\(205.21 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Design and validation of mixed-signal integrated systems require system-level model abstractions. Generalized Volterra series based models have been successfully applied for analog and RF component macromodels, but their complexity can sometimes limit their utility for time-varying systems and large circuits with complex device models or numerous parasitics. In this paper we propose simple and efficient analog and RF circuit macromodels that provide accurate model abstractions for large, complex ...

Keywords: analog/RF circuits, macromodel

- 4 [RF CMOS design: Design of a fully-integrated BiCMOS/FBAR reconfigurable RF receiver front-end](#)

C. P. Moreira, A. A. Shirakawa, E. Kerhervé, J. M. Pham, P. Jarry, D. Belot, P. Ancey
September 2005 **Proceedings of the 18th annual symposium on Integrated circuits and system design SBCCI '05**

Full text available:  [pdf\(560.25 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This article presents guidelines to design a dual-standard fully-integrated RF receiver front-end (RFFE). The designed front-end consists of two system selection integrated FBAR filters, a dual-standard low-noise amplifier (LNA), an active single-to-differential converter (SDC) and I/Q downconversion mixers. The active blocks use the 0.25-mm 60-GHz f_T SiGe:C BiCMOS7RF process from STMicroelectronics. The proposed RFFE is targeted to DCS1800 (1805-1880MHz) and W-CDMA-FDD (2110-2170MHz) wireless s ...

Keywords: BAW technology, FBAR integrated filters, RF receiver front-end, direct conversion receiver architecture, dual-standard operation, low noise amplifier

- 5 [RF design: Dual-mode RF receiver front-end using a 0.25-μm 60-GHz f_TSiGe:C BiCMOS7RF technology](#)

C. P. Moreira, E. Kerhervé, P. Jarry, A. A. Shirakawa, D. Belot

September 2004 **Proceedings of the 17th symposium on Integrated circuits and system design**

Full text available:  [pdf\(349.50 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents a dual-mode RF receiver front-end consisting of a LNA, an active single-ended-to-differential converter and a downconversion mixer. It uses a high performance 0.25-μm 60-GHz f_T SiGe:C BiCMOS7RF integration technology from STMicroelectronics. The proposed RF receiver front-end (RFFE) is targeted to GSM1800 (1805-1880MHz) and WCDMA-FDD (2110-2170MHz) systems. The main motivation of this work is to share as many elements as possible in both modes avoiding conventional ...

Keywords: RF receiver front-end, direct conversion receiver architecture, high performance integration technology, low noise amplifier, multi-mode operation, noise/input impedance optimisation methodology

6 Analysis and White-Box Modeling of Weakly Nonlinear Time-Varying Circuits

Petr Dobrovolny, Gerd Vandersteen, Piet Wambacq, Stephane Donnay

March 2003 **Proceedings of the conference on Design, Automation and Test in Europe - Volume 1 DATE '03**

Full text available:  pdf(166.00 KB)

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The architectural study of wireless communication systems typically requires simulations with high-level models for different analog and RF blocks. Among these blocks, frequency-translating devices such as mixers pose problems in RF circuit simulation since their response typically covers a mix of long- and short-time scales. This paper proposes a technique to analyze and model nonlinear frequency-translating RF circuits such as up-and down conversion mixers. The proposed method is based on a ge ...

7 A Signature Test Framework for Rapid Production Testing of RF Circuits

R. Voorakaranam, S. Cherubal, A. Chatterjee

March 2002 **Proceedings of the conference on Design, automation and test in Europe**

Full text available:  pdf(401.87 KB)

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Production test costs for today's RF circuits are rapidly escalating. Two factors are responsible for this cost escalation: (a) the high cost of RF ATEs and (b) long test times required by elaborate performance tests. In this paper, we propose a framework for low-cost signature test of RF circuits using modulation of a baseband test signal and subsequent demodulation of the DUT response. The demodulated response of the DUT is used as a "signature" from which all the performance specifications are predi ...

8 Behavioral Modeling and Simulation of a Mixed Analog/Digital Automatic Gain Control Loop in a 5 GHz WLAN Receiver

Wolfgang Eberle, Gerd Vandersteen, Piet Wambacq, Stephane Donnay, Georges Gielen, Hugo De Man

March 2003 **Proceedings of the conference on Design, Automation and Test in Europe - Volume 1 DATE '03**

Full text available:  pdf(270.26 KB)

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Wireless LAN (WLAN) operating in the 5-6 GHz range, become commercially viable only, if they can be produced at low cost. Consequently, tight integration of the physical layer, consisting of the radio front-end and the digital signal processing part, is a must. Especially with respect to mixed-signal feedback loops, with automatic gain control as a recurring example, existing tools have major difficulties in offering efficient ways of modeling and simulation. We present a modeling approach where ...

9 Circuits for low power wireless: A CMOS even harmonic mixer with current reuse for low power applications

Ming-Feng Huang, Shuenn-Yuh Lee, Chung J. Kuo

August 2004 **Proceedings of the 2004 international symposium on Low power electronics and design**

Full text available:  pdf(281.20 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents a novel topology for the even harmonic mixer (EHM). The proposed mixer employs current reuse and double frequency circuits in the RF input stage and LO stage, respectively, to improve its linearity and isolation. In addition, the proposed topology has the advantage of the low power consumption. In order to demonstrate the benefits of the proposed mixer, theoretical analyses of conversion gain and linearity have been described in details. The measured results reveal that the p ...

Keywords: current reuse, low power, mixer

10 Numerical techniques for simulation: A frequency relaxation approach for analog/RF system-level simulation

Xin Li, Yang Xu, Peng Li, Padmini Gopalakrishnan, Lawrence T. Pileggi

June 2004 **Proceedings of the 41st annual conference on Design automation**

Full text available:  pdf(191.49 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The increasing complexity of today's mixed-signal integrated circuits necessitates both top-down and bottom-up system-level verification. Time-domain state-space modeling and simulation approaches have been successfully applied for such purposes (e.g. Simulink); however, analog circuits are often best analyzed in the frequency domain. Circuit-level analyses, such as harmonic balance, have been successfully extended to the frequency domain [2], but these algorithms are impractical for simulating ...

Keywords: analog/RF circuits, system-level simulation

11 Tools and methodology for RF IC design

Al Dunlop, Alper Demir, Peter Feldmann, Sharad Kapur, David Long, Robert Melville, Jaijeet Roychowdhury

May 1998 **Proceedings of the 35th annual conference on Design automation**

Full text available:  pdf(326.34 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)
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We describe powerful new techniques for the analysis of RF circuits. Next-generation CAD tools based on such techniques should enable RF designers to obtain a more accurate picture of how their circuits will operate. These new simulation capabilities will be essential in order to reduce the number of design iterations needed to produce complex RFICs.

Keywords: custom sizing, migration, timing optimization

12 Emerging design and tool challenges in RF and wireless applications: New techniques for non-linear behavioral modeling of microwave/RF ICs from simulation and nonlinear microwave measurements

David E. Root, John Wood, Nick Tufillaro

June 2003 **Proceedings of the 40th conference on Design automation**

Full text available:  pdf(337.31 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper compares and contrasts recent nonlinear behavioral modeling techniques designed for microwave and RFIC applications which arise in radio and communication systems, and in the design of broad-band nonlinear components used for microwave instrumentation. These techniques include dynamic neural networks and nonlinear time series models in the time-domain, nonlinear

describing functions in the frequency domain, and envelope-based methods in mixed time and frequency domains. Approaches to ...

Keywords: MMICs, RFICs, behavioral modeling, circuit simulation, nonlinear dynamics, nonlinear modeling, nonlinear simulation

13 Analysis of Nonlinearities in RF Front-End Architectures Using a Modified Volterra Series Approach

M. Goffioul, P. Wambacq, G. Vandersteen, S. Donnay

March 2002 **Proceedings of the conference on Design, automation and test in Europe**

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RF front-end architectures of today's wireless applications need to meet tough requirements on nonlinear distortion to minimize unwanted effects such as crosstalk. An analysis of the nonlinear behavior of analog communication circuits or architectures is not straightforward. This paper presents a modified Volterra series approach to the simulation of nonlinear systems described at the architectural level. The total computed response is decomposed in its nonlinear contributions and the main nonlinearities ...

14 Session 5B: Embedded tutorial: CAD solutions and outstanding challenges for mixed-signal and RF IC design: CAD solutions and outstanding challenges for mixed-signal and RFIC design

Domine Leenaerts, Georges Gielen, Rob A. Rutenbar

November 2001 **Proceedings of the 2001 IEEE/ACM international conference on Computer-aided design**

Full text available: [!\[\]\(1eaf5fdb87c1089a828f0e3675767edd_img.jpg\) pdf\(1.87 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This tutorial paper addresses the problems and solutions that are posed by the design of mixed-signal integrated systems on chip (SoC). These include problems in mixed-signal design methodologies and flows, problems in analog design productivity, as well as open problems in analog, mixed-signal and RF design, modeling and verification tools. The tutorial explains the problems that are posed by these mixed-signal/RF SoC designs, describes the solutions and their underlying methods that exist today ...

15 CAD for RF circuits

P. Wambacq, G. Vandersteen, J. Phillips, J. Roychowdhury, W. Eberle, B. Yang, D. Long, A. Demir

March 2001 **Proceedings of the conference on Design, automation and test in Europe**

Full text available: [!\[\]\(212a2318a401861c7559cff43c43bd71_img.jpg\) pdf\(396.98 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

16 Time-domain non-Monte Carlo noise simulation for nonlinear dynamic circuits with arbitrary excitations

Alper Demir, Edward W. Y. Liu, Alberto L. Sangiovanni-Vincentelli

November 1994 **Proceedings of the 1994 IEEE/ACM international conference on Computer-aided design**

Full text available: [!\[\]\(eb4dc672d1e7608e04a5bba6d4629cdd_img.jpg\) pdf\(840.83 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A new, time-domain, non-Monte Carlo method for computer simulation of electrical noise in nonlinear dynamic circuits with arbitrary excitations is presented. This time-domain noise simulation method is based on the results from the theory of stochastic differential equations. The noise simulation method is general in the sense that any nonlinear dynamic circuit with any kind of exci ...

17 Low Cost Analog Testing of RF Signal Paths

Marcelo Negreiros, Luigi Carro, Altamiro A. Susin

February 2004 **Proceedings of the conference on Design, automation and test in Europe - Volume 1**

Full text available: [pdf\(374.70 KB\)](#) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

A low cost method for testing analog RF signal paths suitable for BIST implementation in a SoC environment is described. The method is based on the use of a simple and low-cost one-bit digitizer that enables the reuse of processor and memory resources available in the SoC, while incurring little analog area overhead. The proposed method also allows a constant load to be observed by the circuit, since no switches or muxes are needed for digitizing specific test points. Mathematical background and ...

18 An 8mA, 3.8dB NF, 40dB gain CMOS front-end for GPS applications

F. Svelto, S. Deantoni, G. Montagna, R. Castello

August 2000 **Proceedings of the 2000 international symposium on Low power electronics and design**

Full text available: [pdf\(1.75 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

A fully differential 0.35&mug;m CMOS LNA plus mixer, tailored to a double conversion architecture, for GPS applications has been realized. The LNA makes use of an inductively degenerated input stage and a resonant LC load, featuring 12% frequency tuning, accomplished by an MOS varactor. The mixer is a Gilbert cell like, in which an NMOS and a PMOS differential pair, shunted together, realize the input stage. This topology allows to save power, for given mixer gain and linearity. The front-e ...

Keywords: CMOS, circuit-analog, communication, design, low-power design, low-power dissipation, performances trade-off

19 Optimization of a fully integrated low power CMOS GPS receiver

Peter Vancorenland, Philippe Coppejans, Wouter De Cock, Paul Leroux, Michiel Steyaert

November 2002 **Proceedings of the 2002 IEEE/ACM international conference on Computer-aided design**

Full text available: [pdf\(94.55 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper describes an optimization technique able to optimize a complete wireless receiver architecture in a reasonable amount of time. The optimizer alternates between spice level optimizations of simple building blocks and a full architecture optimization of the whole based on accurate models of the building blocks. The models of the building blocks are interpolated over the data points acquired in the Spice level simulations. The optimizer technique has been applied to the optimization of a ...

20 Poster session 2: A high performance CMOS direct down conversion mixer for UWB system

Anh-Tuan Phan, Chang-Wan Kim, Min-Suk Kang, Sang-Gug Lee, Chun-Deok Su, Hoon-Tae Kim

April 2004 **Proceedings of the 14th ACM Great Lakes symposium on VLSI**

Full text available:  [pdf\(210.49 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper represents a high performance wideband CMOS direct down-conversion mixer for UWB based on 0.18 μm CMOS technology. The proposed mixer uses the current bleeding technique and an extra resonant inductor to improve the conversion gain, noise figure (NF) and linearity. Also, with an extra inductor and the careful choosing of transistor sizes, the mixer has a very low flicker noise. The shunt resistor matching is applied to have a 528MHz bandwidth matching at 50 Ohm. The simulation re ...

Keywords: UWB, direct down conversion mixer, flicker noise, mixer

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- 1** [Construction engineering and project management: Construction engineering I: simulation as a tool for resource management](#) 

Tarek M. Zayed, Daniel W. Halpin

 December 2000 **Proceedings of the 32nd conference on Winter simulation**

 Full text available:  [pdf\(909.32 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

The decision-making process is a very essential part of any construction operation. Simulation can be used as a tool to assist construction managers in making informed decisions. In this paper, simulation is applied to a Concrete Batch Plant to analyze alternative solutions and resource management. Data is collected to define activity durations for the plant. A simulation model is constructed for the plant using the Micro CYCLONE simulation system. Based on sensitivity analysis, management tools ...

- 2** [Simulation methods for RF integrated circuits](#) 

Ken Kundert

 November 1997 **Proceedings of the 1997 IEEE/ACM international conference on Computer-aided design**

 Full text available:  [pdf\(97.56 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index](#)
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The principles employed in the development of modern RF simulators are introduced and the various techniques currently in use, or expected to be in use in the next few years, are surveyed. Frequency and time domain techniques are presented and contrasted, as are steady state and envelope techniques and large and small signal techniques.

Keywords: RF integrated circuits, envelope techniques, integrated circuit modelling, modern RF simulators, simulation methods, small signal techniques, state techniques, time domain techniques

- 3** [Time-domain non-Monte Carlo noise simulation for nonlinear dynamic circuits with arbitrary excitations](#) 

Alper Demir, Edward W. Y. Liu, Alberto L. Sangiovanni-Vincentelli

November 1994 **Proceedings of the 1994 IEEE/ACM international conference on Computer-aided design**

Full text available: [pdf\(840.83 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A new, time-domain, non-Monte Carlo method for computer simulation of electrical noise in nonlinear dynamic circuits with arbitrary excitations is presented. This time-domain noise simulation method is based on the results from the theory of stochastic differential equations. The noise simulation method is general in the sense that any nonlinear dynamic circuit with any kind of exci ...

- 4 [Construction engineering and project management: Practical approaches for validating a construction simulation](#) 

Jonathan Jingsheng Shi

December 2001 **Proceedings of the 33rd conference on Winter simulation**

Full text available: [pdf\(271.23 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents three methods implemented in the activity-based construction modeling and simulation (ABC) system for validating a construction simulation. The first method reports a simulation experiment in the chronological order so that the user can examine the operating sequence of the model. The second method provides the summary information of total operating counts and mean durations of all activities in the model so that the user can evaluate whether all activities have been correctl ...

- 5 [Simphony: an environment for building special purpose construction simulation tools](#) 

Dany Hajjar, Simaan AbouRizk

December 1999 **Proceedings of the 31st conference on Winter simulation: Simulation---a bridge to the future - Volume 2**

Full text available: [pdf\(393.45 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

- 6 [Behavioral Modeling and Simulation of a Mixed Analog/Digital Automatic Gain Control Loop in a 5 GHz WLAN Receiver](#) 

Wolfgang Eberle, Gerd Vandersteen, Piet Wambacq, Stephane Donnay, Georges Gielen, Hugo De Man

March 2003 **Proceedings of the conference on Design, Automation and Test in Europe - Volume 1 DATE '03**

Full text available: [pdf\(270.26 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

 [Publisher Site](#)

Wireless LAN (WLAN) operating in the 5-6 GHz range, become commercially viable only, if they can be produced at low cost. Consequently, tight integration of the physical layer, consisting of the radio front-end and the digital signal processing part, is a must. Especially with respect to mixed-signal feedback loops, with automatic gain control as a recurring example, existing tools have major difficulties in offering efficient ways of modeling and simulation. We present a modeling approach where ...

- 7 [Efficient time-domain simulation of telecom frontends using a complex damped exponential signal model](#) 

P. Vanassche, G. Gielen, W. Sansen

March 2001 **Proceedings of the conference on Design, automation and test in Europe**

8 [Iron and steelmaking facility planning simulation model](#)

David P. Koch

December 1979 **Proceedings of the 11th conference on Winter simulation - Volume 1**

Full text available:  pdf(595.22 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

Simulation models of iron and steelmaking facilities have been successfully developed to test the productive capabilities of numerous plants. Representative, critical facilities and events have been selected for discussion.

9 [Poster session 2: A high performance CMOS direct down conversion mixer for UWB system](#)

Anh-Tuan Phan, Chang-Wan Kim, Min-Suk Kang, Sang-Gug Lee, Chun-Deok Su, Hoon-Tae Kim

April 2004 **Proceedings of the 14th ACM Great Lakes symposium on VLSI**

Full text available:  pdf(210.49 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper represents a high performance wideband CMOS direct down-conversion mixer for UWB based on 0.18 μ m CMOS technology. The proposed mixer uses the current bleeding technique and an extra resonant inductor to improve the conversion gain, noise figure (NF) and linearity. Also, with an extra inductor and the careful choosing of transistor sizes, the mixer has a very low flicker noise. The shunt resistor matching is applied to have a 528MHz bandwidth matching at 50 Ohm. The simulation re ...

Keywords: UWB, direct down conversion mixer, flicker noise, mixer

10 [Making Fourier-envelope simulation robust](#)

Jaijeet Roychowdhury

November 2002 **Proceedings of the 2002 IEEE/ACM international conference on Computer-aided design**

Full text available:  pdf(1.04 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Fourier-envelope algorithms are an important component of the mixed-signal/RF verification toolbox. In this paper, we address the unpredictability and lack of robustness that has been reported for these algorithms. We show that the problem stems from fast oscillations in envelopes that are expected to be slowly varying. We demonstrate that this is related to the fact that the envelope equations are always stiff, whether or not the underlying system is. We show that careful choice of envelope ini ...

11 [Modeling for analog circuits: High-frequency noise in RF active CMOS mixers](#)

Payam Heydari

January 2004 **Proceedings of the 2004 conference on Asia South Pacific design automation: electronic design and solution fair ASP-DAC '04 , Proceedings of the 2004 conference on Asia South Pacific design automation: electronic design and solution fair ASP-DAC '04**

Full text available:  pdf(188.90 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

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A new analytical model for high-frequency noise in RF active CMOS mixers such as single-balanced and double-balanced architectures is presented. The analysis includes the contribution of non-white gate-induced noise at the output as well as the spot noise figure (NF) of the RF CMOS mixer, while accounting for the non-zero correlation between the gate-induced noise and the channel thermal noise. The noise contribution of the RF transconductor as well as the switching pair on the output noise is di ...

12 Analogue Fault Modelling and Simulation for Supply Current Monitoring

M. Zwolinski, C. Chalk, B. R. Wilkins

March 1996 **Proceedings of the 1996 European conference on Design and Test**

Full text available:  pdf(574.67 KB)



Additional Information: [full citation](#), [abstract](#)

[Publisher Site](#)

Fault simulation of analogue circuits is a very CPU intensive task. This paper describes a technique to increase the speed of fault simulation. The effects of bridging faults within operational amplifiers have been classified according to the externally observable behaviour reducing the number of fault simulations by two thirds. Parameterisable macromodels have been written in which both fault-free specifications and faulty effects can be modelled. The supply current is also modelled. These macr ...

Keywords: Analogue Modelling, Circuit Simulation, Testing, SPICE

13 Advanced simulation techniques: A time-domain RF steady-state method for closely spaced tones

Jaijeet Roychowdhury

June 2002 **Proceedings of the 39th conference on Design automation**

Full text available:  pdf(543.95 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Verifying circuits with two or more closely-spaced driving frequencies is important in RF and wireless communications, e.g., in the design of down-conversion mixers. Existing steady-state calculation methods, like harmonic balance, rely on Fourier series expansions to find the difference-frequency components typically of interest. Time-domain methods are, however, better suited for circuits with strong nonlinearities such as switching. Towards this end, we present a purely time-domain met ...

Keywords: MPDE, RF switching mixers, analog, analog/RF simulation, artificial time scales, continuation methods, difference-frequency time scales, envelope, harmonic balance, homotopy, mixed-signal, multi-time PDEs, shooting

14 Numerical techniques for simulation: Robust, stable time-domain methods for solving MPDEs of fast/slow systems

Ting Mei, Jaijeet Roychowdhury, Todd S. Coffey, Scott A. Hutchinson, David M. Day

June 2004 **Proceedings of the 41st annual conference on Design automation**

Full text available:  pdf(856.14 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we explore in detail the stability properties of time-domain numerical methods for multi-time partial differential equations (MPDEs). We demonstrate that simple techniques for numerical discretization can lead easily to instability. By investigating the underlying eigenstructure of several discretization techniques along different artificial time scales, we show that not all combinations of techniques are stable. We identify choices of discretization method and of step size

along ...

Keywords: MPDE, eigenstructure, envelope, stability, time-domain discretization

15 Efficient methods for simulating highly nonlinear multi-rate circuits



Jaijeet Roychowdhury

June 1997 **Proceedings of the 34th annual conference on Design automation - Volume 00**

Full text available: [pdf\(1.19 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)
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Widely-separated time scales appear in many electronic circuits, making traditional analysis difficult or impossible if the circuits are highly nonlinear. In this paper, an analytical formulation and numerical methods are presented for treating strongly nonlinear multi-rate circuits effectively. Multivariate functions in the time domain are used to capture widely separated rates efficiently, and a special partial differential equation (the MPDE) is shown to relate the multivariate forms of a circu
...

16 Numerical techniques for simulation: A frequency relaxation approach for analog/RF system-level simulation



Xin Li, Yang Xu, Peng Li, Padmini Gopalakrishnan, Lawrence T. Pileggi

June 2004 **Proceedings of the 41st annual conference on Design automation**

Full text available: [pdf\(191.49 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The increasing complexity of today's mixed-signal integrated circuits necessitates both top-down and bottom-up system-level verification. Time-domain state-space modeling and simulation approaches have been successfully applied for such purposes (e.g. Simulink); however, analog circuits are often best analyzed in the frequency domain. Circuit-level analyses, such as harmonic balance, have been successfully extended to the frequency domain [2], but these algorithms are impractical for simulating ...

Keywords: analog/RF circuits, system-level simulation

17 Advanced simulation techniques: Time-domain steady-state simulation of frequency-dependent components using multi-interval Chebyshev method



Baolin Yang, Joel Phillips

June 2002 **Proceedings of the 39th conference on Design automation**

Full text available: [pdf\(139.65 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Simulation of RF circuits often demands analysis of distributed component models that are described via frequency-dependent multi-port Y , Z , or S parameters. Frequency-domain methods such as harmonic balance are able to handle these components without difficulty, while they are more difficult for time-domain simulation methods to treat. In this paper, we propose a hybrid frequency-time approach to treat these components in steady-state time-domain simulations. Efficiency is ...

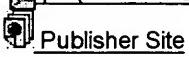
Keywords: RF circuit simulation, S parameter, frequency dependent

18 Analysis and White-Box Modeling of Weakly Nonlinear Time-Varying Circuits

Petr Dobrovolny, Gerd Vandersteen, Piet Wambacq, Stephane Donnay

March 2003 **Proceedings of the conference on Design, Automation and Test in Europe - Volume 1 DATE '03**

Full text available:  pdf(166.00 KB)



Additional Information: [full citation](#), [abstract](#), [index terms](#)

The architectural study of wireless communication systems typically requires simulations with high-level models for different analog and RF blocks. Among these blocks, frequency-translating devices such as mixers pose problems in RF circuit simulation since their response typically covers a mix of long- and short-time scales. This paper proposes a technique to analyze and model nonlinear frequency-translating RF circuits such as up-and down conversion mixers. The proposed method is based on a ge ...

19 Simulation of high-Q oscillators

M. Gourary, S. Ulyanov, M. Zharov, S. Rusakov

November 1998 **Proceedings of the 1998 IEEE/ACM international conference on Computer-aided design**

Full text available:  pdf(791.27 KB) Additional Information: [full citation](#), [references](#), [index terms](#)

20 Circuits for low power wireless: A CMOS even harmonic mixer with current reuse for low power applications

Ming-Feng Huang, Shuenn-Yuh Lee, Chung J. Kuo

August 2004 **Proceedings of the 2004 international symposium on Low power electronics and design**

Full text available:  pdf(281.20 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents a novel topology for the even harmonic mixer (EHM). The proposed mixer employs current reuse and double frequency circuits in the RF input stage and LO stage, respectively, to improve its linearity and isolation. In addition, the proposed topology has the advantage of the low power consumption. In order to demonstrate the benefits of the proposed mixer, theoretical analyses of conversion gain and linearity have been described in details. The measured results reveal that the p ...

Keywords: current reuse, low power, mixer

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1. Nonlinear models for the intermodulation analysis of FET mixers

Peng, S.; McCleer, P.J.; Haddad, G.I.;
Microwave Theory and Techniques, IEEE Transactions on
Volume 43, Issue 5, May 1995 Page(s):1037 - 1045
Digital Object Identifier 10.1109/22.382063

[AbstractPlus](#) | Full Text: [PDF\(668 KB\)](#) IEEE JNL

2. Intermodulation analysis of FET resistive mixers using Volterra series

Peng, S.; McCleer, P.J.; Haddad, G.I.;
Microwave Symposium Digest, 1996., IEEE MTT-S International
Volume 3, 17-21 June 1996 Page(s):1377 - 1380 vol.3
Digital Object Identifier 10.1109/MWSYM.1996.512192

[AbstractPlus](#) | Full Text: [PDF\(284 KB\)](#) IEEE CNF

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Sotli Peng; McCleer, P.J.; Haddad, G.I.;
Microwave Symposium Digest, 1994., IEEE MTT-S International
23-27 May 1994 Page(s):1575 - 1578 vol.3
Digital Object Identifier 10.1109/MWSYM.1994.335273

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IEEE CNF IEEE Conference Proceeding

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IEEE STD IEEE Standard

1. **Chip-type LTCC-MLC baluns using the stepped impedance method**
Ching-Wen Tang; Jyh-Wen Sheen; Chi-Yang Chang;
Microwave Theory and Techniques, IEEE Transactions on
Volume 49, Issue 12, Dec. 2001 Page(s):2342 - 2349
Digital Object Identifier 10.1109/22.971619

[AbstractPlus](#) | [References](#) | [Full Text: PDF\(180 KB\)](#) IEEE JNL

2. **Electrically band-limited CSRZ signal with simple generation and large dispersion tolerance for 40-Gb/s WDM transmission systems**
Dong-Soo Lee; Man Seop Lee; Yang Jing Wen; Nirmalathas, A.;
Photonics Technology Letters, IEEE
Volume 15, Issue 7, July 2003 Page(s):987 - 989
Digital Object Identifier 10.1109/LPT.2003.813389

[AbstractPlus](#) | [References](#) | [Full Text: PDF\(254 KB\)](#) IEEE JNL

3. **MOSFET linearity performance degradation subject to drain and gate voltage stress**
Chuanzhao Yu; Yuan, J.S.; Hong Yang;
Device and Materials Reliability, IEEE Transactions on
Volume 4, Issue 4, Dec. 2004 Page(s):681 - 689
Digital Object Identifier 10.1109/TDMR.2004.838407

[AbstractPlus](#) | [References](#) | [Full Text: PDF\(976 KB\)](#) IEEE JNL

4. **A high-level VHDL-AMS model design methodology for analog RF LNA and mixer**
Yang, W.; Carter, H.; Yan, J.;
Behavioral Modeling and Simulation Conference, 2004. BMAS 2004. Proceedings of the 2004
IEEE International
21-22 Oct. 2004 Page(s):125 - 129
Digital Object Identifier 10.1109/BMAS.2004.1393994

[AbstractPlus](#) | [Full Text: PDF\(607 KB\)](#) IEEE CNF

5. **A 900MHz low voltage low power highly linear mixer for direct-conversion receivers**
Moon-Su Yang; Hye-Ryoung Kim; Sang-Gug Lee;
Electronics, Circuits and Systems, 2003. ICECS 2003. Proceedings of the 2003 10th IEEE
International Conference on
Volume 3, 14-17 Dec. 2003 Page(s):974 - 977 Vol.3
Digital Object Identifier 10.1109/ICECS.2003.1301671

[AbstractPlus](#) | [Full Text: PDF\(1423 KB\)](#) IEEE CNF

6. **A frequency separation macromodel for system-level simulation of RF circuits**
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Design Automation Conference, 2003. Proceedings of the ASP-DAC 2003. Asia and South Pacific
21-24 Jan. 2003 Page(s):891 - 896

[AbstractPlus](#) | [Full Text: PDF\(659 KB\)](#) IEEE CNF

7. **Computer-aided design techniques for microwave monolithic integrated circuits**
Sharma, A.K.; Wang, H.; Ton, N.; Aust, M.; Yonaki, J.; Shioi, J.; Dow, S.; Yang, D.; Liu, L.C.T.;
Microwave Symposium Digest, 1990., IEEE MTT-S International
8-10 May 1990 Page(s):555 - 558 vol.1
Digital Object Identifier 10.1109/MWSYM.1990.99641

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1. Design of SiGe/Si heterojunction bipolar transistor for RF mixer application

You-Lin Wu; Yin-Hsin, H.; Tian-Shuan, L.; Huey-Liang Hwang;
Solid-State and Integrated-Circuit Technology, 2001. Proceedings. 6th International Conference
on
Volume 1, 22-25 Oct. 2001 Page(s):230 - 235 vol.1
Digital Object Identifier 10.1109/ICSICT.2001.981462
[AbstractPlus](#) | Full Text: [PDF\(333 KB\)](#) IEEE CNF

IEEE STD IEEE Standard



2. Power-area evaluation of various double-gate RF mixer topologies

Reddy, M.V.R.; Sharma, D.K.; Patil, M.B.; Rao, V.R.;
Electron Device Letters, IEEE
Volume 26, Issue 9, Sept. 2005 Page(s):664 - 666
Digital Object Identifier 10.1109/LED.2005.853632

[AbstractPlus](#) | Full Text: [PDF\(168 KB\)](#) IEEE JNL

3. Analysis and white-box modeling of weakly nonlinear time-varying circuits

Dobrovolny, P.; Vandersteen, G.; Wambacq, P.; Donnay, S.;
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